

modern extensions, such as harmonic ranges and coaxial circles, which now form a customary part of the school course.

(3) In this treatise the elements of coordinate geometry are presented in a compact form. The first twelve chapters are devoted to the treatment of the line, circle, conic, and other curves, while the remaining six deal with the line in space and the surfaces of the second degree. The experience of the authors has led them to introduce a number of changes in the order of development of the subject. The equation of the straight line is given, before the customary work on lengths and areas; they advise the student to read the chapter on the parabola before that on the circle, thereby enabling him to see at an early stage how analytical methods may be used to obtain properties which are new to him. All mention of pole and polar properties is deferred until after the treatment of the general conic, and the application of Cartesian methods to the investigation of loci is postponed to the final chapter of the first part of the book.

The section on solid geometry, while omitting the more complicated analytical formulæ, is sufficiently thorough to enable the student to attack with success any problem on the geometry of the conicoid of a straightforward character. There are numerous exercises and diagrams. In every respect this book is admirably suited to meet the needs of those who are reading the subject for the first time.

(4) The range of work covered by Mr. Radford's useful book includes the binomial theorem and the exponential and logarithmic expansions. Quadratic equations and graphical solutions are introduced at the start, and logarithms appear at an early stage. There are also ten book-work papers.

(5) The papers set in recent examinations conducted by the Civil Service Commissioners have included a number of problems of a much more practical character than are to be found in the ordinary academic text-book. That this type of question is both stimulating and of real educational value is beyond question, but up to the present there has been no convenient collection of problems of this character. Mr. Fawdry's book now supplies exactly what is wanted. Primarily, it is intended for army candidates and students in technical colleges, but many of the papers contain practical questions of considerable intrinsic theoretical difficulty, and may therefore profitably be set to boys preparing for entrance college scholarships. A comprehensive set of revision papers adds materially to the utility of this first-rate book.

OUR BOOK SHELF.

Ant Communities and How they are Governed. A Study in Natural Civics. By Dr. H. C. McCook. Pp. xvii+321. (New York and London: Harper and Bros., 1909.) Price 7s. 6d. net.

For thirty-two years Dr. McCook has devoted much time and attention to the habits of American ants, and has published many popular works on the subject, in addition to the two large works on "The Agricultural Ants of Texas" and "The Honey Ants of the Garden of the Gods." In the present work, which is

based chiefly on his own original observations, he discusses the conditions of ant-life from a popular standpoint; and his sixteen chapters deal with such subjects as fraternal confederacies, nesting architecture, engineering, feeding the commune, language, government, dependents, war, aliens, aphid herds, slave-making, sanitation, &c.

Britain is very deficient, both as regards number of species and number of individuals; but the American species are more numerous, and the size of nests and communities of many species is almost incredible. Thus Dr. McCook writes:—"The large conical nests of the mound-making ants of the Alleghanies, *Formica exsectoides* vary in size from newly-begun colonies a few inches high to mature hills, measuring thirty-seven feet in circumference at the base, though rarely more than three feet high. They occur in groups, and in one site near Hollidaysburg, Pennsylvania, within a space of fifty acres, the writer counted seventeen hundred well-developed mounds. At two other localities in these mountains, similar groups were observed even more thickly placed. At "Pine Hill," about thirty acres were occupied, of which five were found to contain two hundred and ninety-three mounds, an average of fifty-nine to the acre, or eighteen hundred for the whole section. At "Warrior's Mark," another large settlement of nearly two hundred hills was visited. Experiments made in the Hollidaysburg group proved that all therein formed substantially one community, in complete fellowship, although the individual mounds appeared to be conducted independently" (pp. 3-5).

Dr. Forel's comment on these observations is:—"These ant kingdoms have in all probability a population of two hundred to four hundred million inhabitants, all forming a single community, and living together in active and friendly intercourse" (quoted at p. 8).

Again, with reference to the cutting ants of Texas, we read:—"A planter, in order to get rid of the depredations of an immense commune near his residence, had set his men to dig it up and utterly root it out. In order to reach the central nest he had traced the ants from a tree inside his home premises, which they had stripped of leaves, to a point six hundred and sixty-nine feet distant. The nest occupied a space as large as a small cellar, the lowest and main cave being as large as a flour-barrel. In this central cavern were great numbers of winged males and females, and innumerable larvæ and workers. From this point radiated the various avenues over which the leaf-cutters marched on their raids" (p. 64).

We could quote equally interesting passages from almost every page of this fascinating volume; but before concluding, we may note that Dr. McCook attaches great importance to the sense of smell in ants.

The numerous text-illustrations are of unusual excellence.

Sextant Errors. By Thos. Y. Baker. Pp. 32. (London: J. Griffin and Co., 1909.) Price 1s. net.

MR. BAKER has supplied a very excellent shillingworth for those who have occasion to use the sextant and wish to understand it properly. Every text-book gives the simple theory of the instrument, and the more ordinary adjustments and tests for errors are generally enough understood, but when the complete theory of an astronomical instrument, worked out on the supposition that no part is quite perfectly made, is required, then only such elaborate books as, for instance, Chauvenet may be turned to with confidence. It will be a great convenience to the sextant user to find in this little book complete demonstrations, free from the usual omission of steps, unnecessary for the writer of

the book, but sadly needed by the reader, of the important errors, with specially prepared tables to facilitate calculation.

The extreme importance of the collimation error and its surprising possible magnitude are pointed out, and a very neat way of ascertaining if the telescopic axis is perpendicular to the index mirror when the arm is suitably turned is described, but it is unfortunate that this is not available in all sextants as made.

One fault must be insisted on. The use of the signs and " for feet and inches instead of the abbreviations ft. and in. is bad enough when used by engineers, but then it is rare that there is fear of confusion. The author, however, gratuitously causes confusion in a book which is bristling with the signs ' and " in their proper meaning by using the symbol " for inches even in the same sentence with ' in its proper meaning. It is to be hoped that this and one or two typographical errors will be corrected in a future edition.

C. V. B.

The British Journal Photographic Almanac, 1910.
Edited by George E. Brown. Pp. 1320. (London: Henry Greenwood and Co.) Price 1s.

THE present issue of this very useful volume is drawn up on the same lines as those of its immediate predecessor, and its contents are of the usual essence of photographic matter on all topics, which makes it such a valuable *aide mémoire* to the working photographer. Commencing with the usual calendar, which begins on p. 407, and not on p. 447 (as it is incorrectly indexed, by the way), there follows the useful directory of photographic societies and bodies. An interesting chapter on lens calculations by mental arithmetic, written by the editor, precedes the large section on the epitome of progress by the same authority. This latter portion is always one of the chief contributions to the volume. Then follows a description of the recent novelties in apparatus, which occupies nearly 100 pages. Formulæ for the principal photographic processes, the developing formulæ of the principal plate and paper makers, miscellaneous information, and the usual large number of valuable chemical, exposure, optical, and other tables, bring the volume to a conclusion.

Another feature of this publication, and one which is so often referred to by those who have the book in their possession, is the excellently indexed mass of advertisements in which the main text of the book is sandwiched.

The volume should find its usual place in every photographer's library.

Outlines of Bacteriology (Technical and Agricultural).
By Dr. David Ellis. Pp. xii+262. (London: Longmans, Green and Co., 1909.) Price 7s. 6d. net.

THE general plan of this book is excellent, but we doubt if the various subjects are dealt with in sufficient detail to render the book of much practical utility to the student. To attempt to deal with disease-producing organisms and all the technical applications of bacteriology in 260 short pages is an impossible task if anything more than general principles is to be considered.

The contents of the book include the general morphology and biology of the bacteria, a subject to which the author has himself contributed, sterilisation, pathogenic bacteria, sulphur and iron bacteria, preservation of food products, nitrification, fermentation and ferments, and their industrial applications (e.g. beer, butter, cheese, tanning, tobacco, &c.), and sewage disposal.

Unfortunately, a number of errors disfigure the text.

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Thus on p. 109 a classification of proteids is given in which one class is termed "amyloids" and is stated to be insoluble in gastric juice, globulins are said to be soluble in dilute acids, and casein is given as an example of a derived albumin, and is said to be soluble in dilute acids. A number of mistakes also occur in the section dealing with pathogenic organisms. In the section on the preservation of food-stuffs by heat, while canning is mentioned, there is no reference to the sterilisation or the pasteurisation of milk. The names of plants yielding flax, hemp, jute, &c., are not correctly given, and on p. 245 a paragraph dealing with the *Bacillus enteritidis* of Gärtner is hopelessly wrong.

The book is clearly printed, and illustrated with a number of figures. Many of these are very diagrammatic and drawn to no scale, so that the reader sees the anthrax bacillus and influenza bacillus depicted about the same size, which is somewhat misleading.

R. T. HEWLETT.

A Descriptive Catalogue of the Dobrée Collection of European Noctuae. Compiled by H. B. Browne. Hull Museum Publications, No. 63. Pp. xv+156. (Hull: A. Brown and Sons, Ltd., 1909.) Price 1s. net.

THE late Nicholas Frank Dobrée, of the New Walk, Beverley, who died in 1908, at the age of seventy-seven, formed a very valuable collection of Palaearctic Noctuae between the years 1871 and 1888, which he subsequently presented to Hull Museum, on the understanding that a complete catalogue should be published. We presume that it will be preserved intact, for we are convinced that special collections of all kinds, whether literary or scientific, are of far greater permanent value whenever it is possible to preserve them thus, than when they are (sometimes unavoidably) dispersed, or even broken up to be incorporated with larger collections. The collection includes longer or shorter series of 654 species, more than 300 named varieties and aberrations, and 720 specimens of preserved larvæ. These are contained in forty-two cabinet drawers, and Mr. Browne has carefully noted the origin of every specimen according to Mr. Dobrée's note-books, and added short descriptions of a large number of aberrant specimens, named or otherwise. The work is of much importance to all students of the interesting group of moths of which it treats.

The Human Race: its Past, Present, and Probable Future. An essay by J. Samuelson. Pp. xii+192. (London: Swan Sonnenschein and Co., Ltd., 1910.) Price 3s. 6d. net.

IN part of this small volume is summarised the whole history of the human race—man's origin and material progress, the history of his vices and virtues, and of his mental, social, and political development. That such a summary must be very superficial is only to be expected, and the author claims very little for it, but hopes "that it will at least stimulate inquiry and serious study on the part of youths about entering life." Its chief fault appears to us to be that there is no clear distinction drawn between changes in man himself and changes in his surroundings. Thus, for example, under the heading "Man's Mental Progress" are catalogued a number of discoveries and inventions, such as the spectroscope and telephone, which are not evidence of mental progress at all if one takes the term to mean improvement of mental powers. It is also to be regretted that, although the author appears to be a believer in evolution, no mention is made of heredity as a factor possibly affecting the history of mankind.

E. H. J. S.